UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2009/2010

April/May 2010

IBG 102 – Biology for Technologists
[Biologi Untuk Ahli Teknologi]

Duration: 3 hours
[Masa: 3 jam]

Please check that this examination paper consists of ELEVEN pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi SEBELAS muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer **FIVE (5)** out of six questions. Answer **FOUR** questions from SECTION A and **ONE** question from SECTION B. You may answer the questions either in Bahasa Malaysia or in English.

*[**Arahan**: Jawab **LIMA (5)** daripada enam soalan. Jawab **EMPAT** soalan daripada BAHAGIAN A dan **SATU** soalan daripada BAHAGIAN B. Anda dibenarkan menjawab soalan sama ada [untuk KBI] dalam Bahasa Malaysia atau Bahasa Inggeris.]*

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai].

...2/-

SECTION A. Answer ALL questions.

1. Answer all parts of this question.

   (a) Discuss the advantages and disadvantages of dark-field microscopy compared to that of bright-field microscopy.

   (7 marks)

   (b) Explain the need of immersion oil in bright field microscopy.

   (3 marks)

   (c) Explain the concept of scanning electron microscopy.

   (10 marks)

2. Answer all parts of this question.

   (a) Antibiotics are generally secondary metabolites. Define secondary metabolism.

   (2 marks)

   (b) Describe the fermentation of penicillin production by *Penicillium chrysogenum* and the factors that affect the fermentation process.

   (18 marks)

3. Answer all parts of this question.

   (a) Briefly describe the following vaccines:

      (i) Inactivated vaccines.

      (2 marks)

      (ii) Live attenuate vaccines.

      (2 marks)

      (iii) Subunits vaccines.

      (2 marks)

      (iv) Toxoids vaccines.

      (2 marks)

   (b) Briefly explain the advantages of using mammalian cell lines for the production of vaccines.

   (4 marks)

   (c) Describe the process of vaccine production by using mammalian Vero cell lines.

   (8 marks)

4. Answer all parts of this question.

   (a) Describe bioaugmentation and biostimulation, and discuss the differences between these two processes.

   (10 marks)

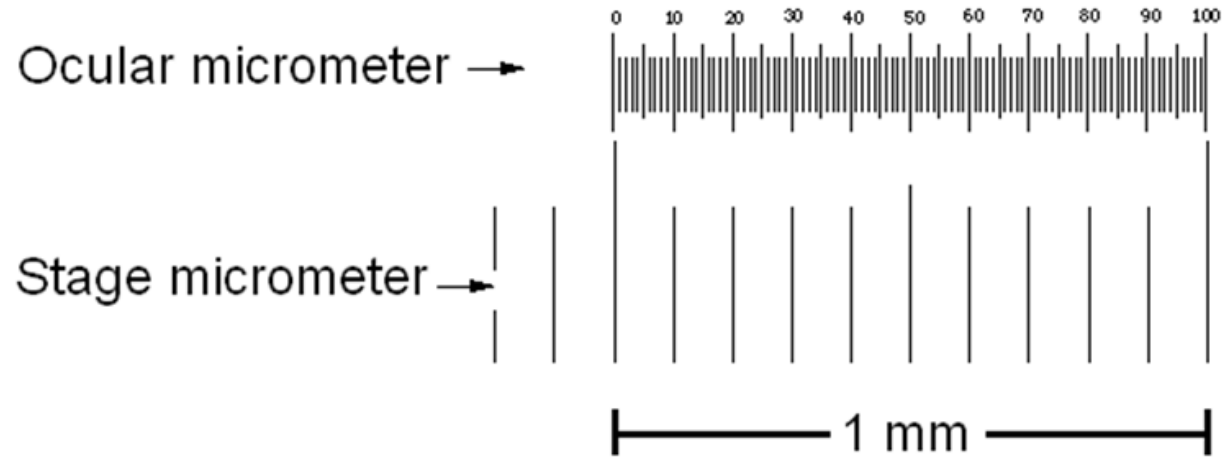
   (b) Describe the advantages of plant tissue culture in phytoremediation.

   (10 marks)

SECTION B. Answer ONE question.

5. Answer all parts of this question.

(a) Determine the length and width of the microorganism as observed in Figure 1. (10 marks)



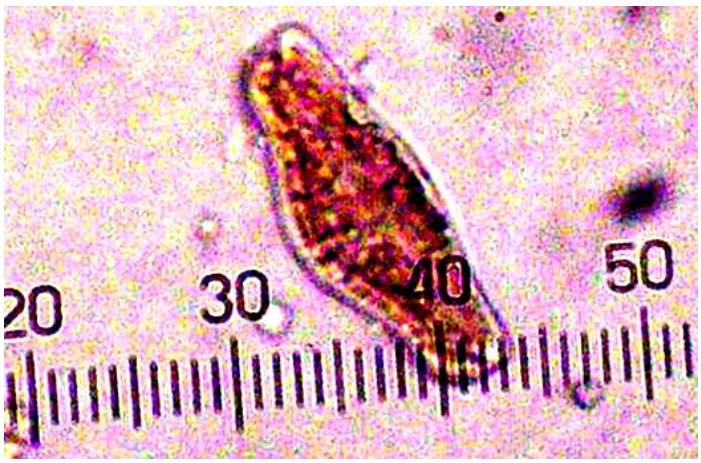


Figure 1: A single cell as observed under the microscope

(b) An aliquot of sample from a microbial solution was placed on a Neubaur chamber with a depth of 0.1 mm (Figure 2).

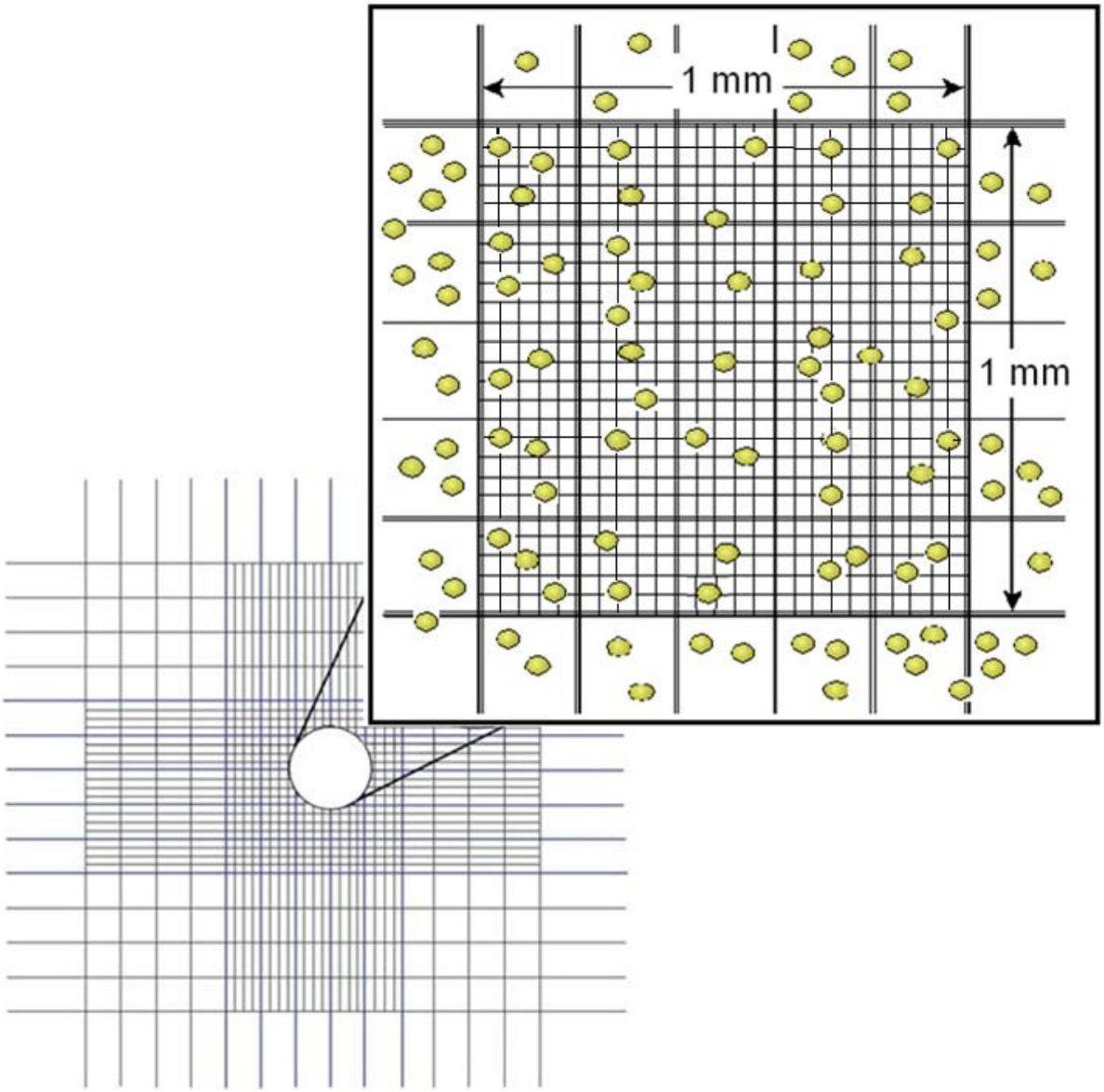


Figure 2: Cells as observed on a Neubaur chamber

Assuming without dilutions, calculate the number of bacterial cells per mL of the sample.
(10 marks)

6. Answer all parts of this question.

(a) Discuss the importance of aseptic techniques in bioprocess laboratory practice.
(3 marks)

(b) Describe the principles of an autoclave.
(7 marks)

(c) Beginning with the aseptic transfer of microorganisms from a universal bottle using a micropipette, detail the steps involved in pour plating.
(10 marks)

BAHAGIAN A. *Jawab SEMUA soalan.*

1. Jawab semua bahagian dalam soalan ini.

(a) Bincangkan kebaikan dan keburukan mikroskopi medan-gelap berbanding dengan medan-cerah.

(7 markah)

(b) Jelaskan keperluan minyak pencelup dalam mikroskopi medan-cerah.

(3 markah)

(c) Jelaskan konsep mikroskopi penskanan elektron.

(10 markah)

2. Jawab semua bahagian dalam soalan ini.

(a) Antibiotik secara umumnya adalah metabolit sekunder. Taksirkan metabolisme sekunder.

(2 markah)

(b) Jelaskan fermentasi penghasilan penisilin oleh Penicillium chrysogenum dan factor-faktor yang mempengaruhi proses fermentasi tersebut.

(18 markah)

3. Jawab semua bahagian dalam soalan ini.

(a) Jelaskan secara ringkas vaksin yang berikut:

(i) Vaksin teraktif.

(2 markah)

(ii) Vaksin hidup ternyahaktif.

(2 markah)

(iii) Vaksin subunit.

(2 markah)

(iv) Vaksin toksoid.

(2 markah)

(b) Jelaskan secara ringkas kebaikan sel mamalia untuk penghasilan vaksin.

(4 markah)

(c) Jelaskan proses penghasilan vaksin melalui sel mamalia Vero.

(8 markah)

4. Jawab semua bahagian dalam soalan ini.

(a) Jelaskan bioaumentasi dan biostimulasi, dan bincangkan perbezaan di antara kedua-dua proses ini.

(10 markah)

(b) Jelaskan kebaikan tisu kultur tumbuhan dalam phitoremediasi.

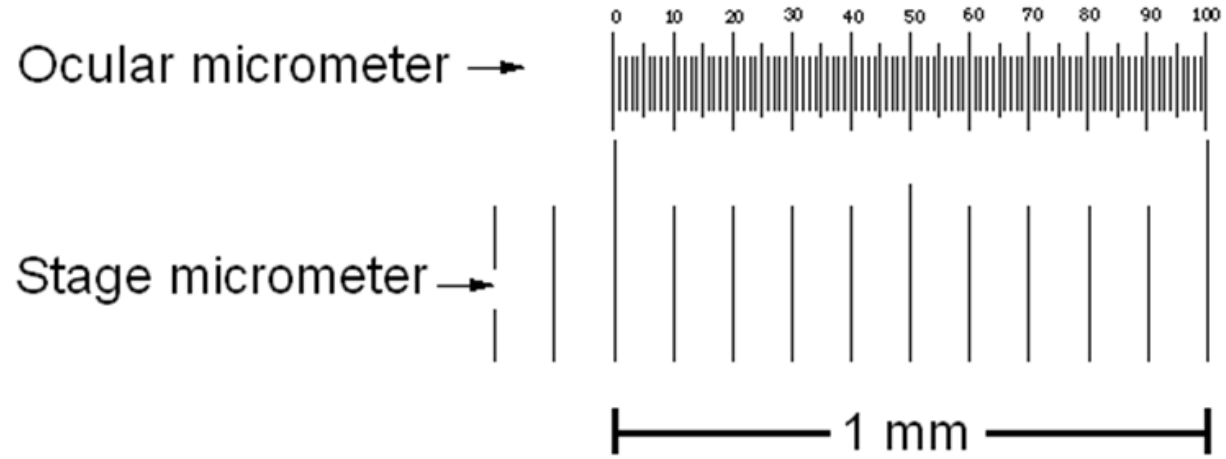
(10 markah)

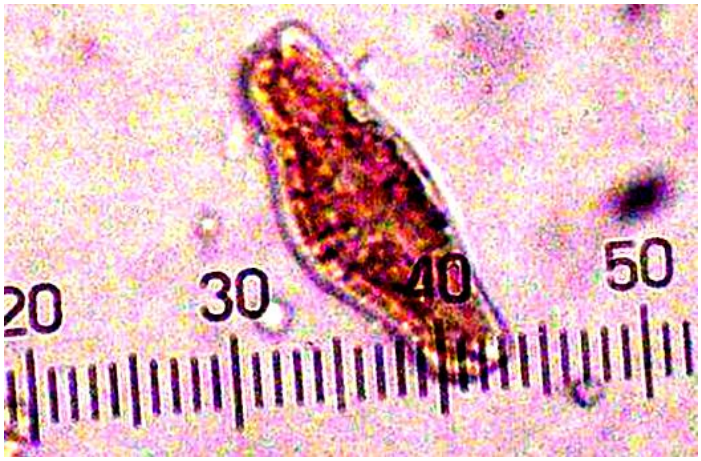
BAHAGIAN B. *Jawab SATU soalan sahaja.*

5. Jawab semua bahagian dalam soalan ini.

(a) Tentukan panjang dan lebar mikroorganisma seperti yang diperhatikan dalam Rajah 1.

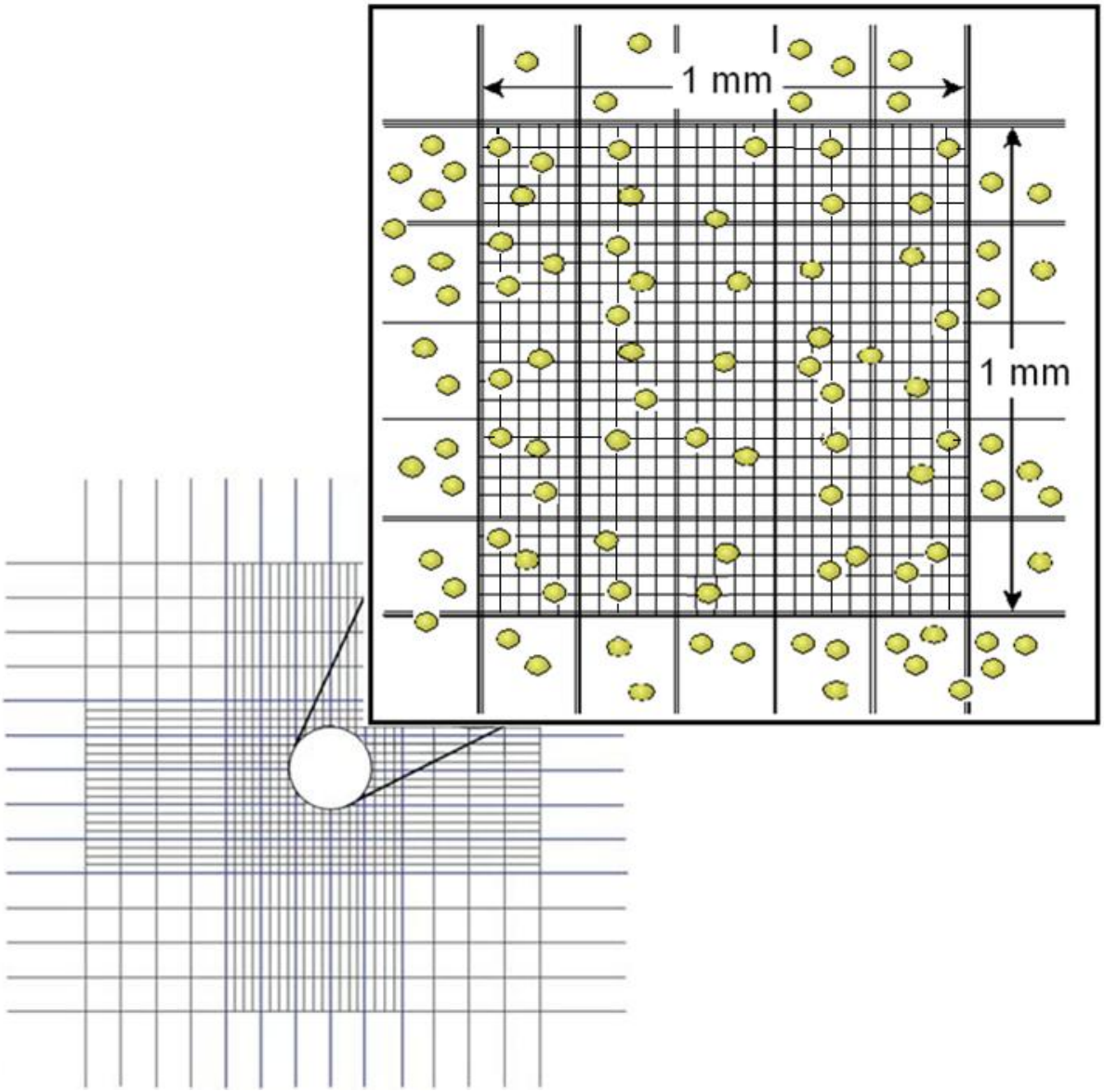
(10 markah)





Rajah 1: Sel tunggal yang diperhatikan di bawah mikroskop

(b) Alikuot satu sampel daripada larutan microbial diletakkan pada kebuk Neubaur dengan kedalaman 0.1 mm (Rajah 2).



Rajah 2: Sel-sel yang diperhatikan pada kebuk Neubaur

Andaikan tiada pencairan, kirakan bilangan sel bacteria dalam satu mL sampel.

(10 markah)

6. *Jawab semua bahagian dalam soalan ini.*

   (a) Bincangkan kepentingan teknik aseptik dalam amalan makmal bioproses.

   (3 markah)

   (b) Jelaskan prinsipal autoklaf.

   (7 markah)

   (c) Bermula dari pemindahan aseptik mikroorganisma daripada botol universal dengan menggunakan pipet mikro, perincikan langkah-langkah yang terlibat dalam curahan plat.

   (10 markah)

- oooOooo -